GEOLOGY OF EFFINGHAM RIDGE—PRELIMINARY REPORT.

By J. W. WILSON, Effingham, Kan. Read before the Academy January 1, 1897.

The ridge under discussion lies in northeast Kansas, with a general north and south trend. The portion under present discussion runs through the center of Atchison county. The crest passes one-half mile west of Effingham, the seat of the Atchison county high school. The elevation of the railroad track, just west of the Delfelder bridge crossing the Central Branch of the Missouri Pacific railroad, one-half mile west of the city limits, is 22.5 feet above the front step of the county high school, as recorded by our aneroid barometer. The difference in elevation between the county high school and low-water mark at Atchison is 327 feet. This makes a total of 394 feet difference between the elevation of the ridge and low-water mark at the Atchison bridge. The elevation drops 182 feet from Delfelder bridge to Muscotah, near the western boundary of the county. This ridge, as has been stated, extends nearly north and south, varying northeast, and is the watershed dividing the waters that flow west into the Delaware river from those flowing east into the Missouri.

Near the east base the Oread limestone outcrops and is about 20 feet thick. This ledge can be traced almost entirely across the state. It is the ledge upon which the State University stands. At the western base of the Effingham ridge, in the bluffs along the Delaware river, are found a number of outcrops of limestone, from which nearly all the building rock of the western part of the county is obtained. In the bed of the Delaware river sandstone beds are occasionally found. Along the west base of the ridge are also found extensive deposits of coal—in some places over a foot in thickness—and from which, 20 years ago, all the coal supply of the county was furnished. The city of Effingham at one time secured all her coal from this region. These veins are worked in but few places now, owing to the cheapening of coal by improved machinery. The shales associated with this coal are very rich in vegetable and animal fossil remains.

The principal limestone ridge in the vicinity of Muscotah is three-fourths of a mile west of town, on a farm owned by William Dunkel, and will in the future be known as "Dunkel Ledge."

This outcrop is about 50 feet above the town, and is frequently seen near the tops of the mounds east of the Delaware, between Muscotah and Arrington. The use of a transit has been secured by the county high school, and these ledges will be carefully worked out in our survey to be carried on next summer.

The general dip of the rocks of this region is to the northwest. Muscotah is a little south of west of Atchison. Supposing the average dip in this direction is five feet to the mile, the Dunkel ledge, being about 264 feet above low-water mark at Atchison, is therefore 162 feet above the Oread limestone. These readings have not been verified by repeated experiments with the barometer, but are approximately correct. They make it probable that the coal of this region is in about the same horizon as the Osage county coal.

I am inclined to believe that the limestone ledges west of Atchison will, when carefully worked out, be correlated with the Dunkel ledge, and probably constitute the bed rock supporting the water-bearing sand in the interior.

GLACIAL DRIFT.

I have frequently found in the western part of this county and in Nemaha county fragments of red sandstone resembling the Dakota Cretaceous. I think I have seen evidences of a moraine south of Atchison. Numerous boulders have

been found over the county. One east of Arrington measures 7½x6 feet, and formerly protruded three feet above the ground. The Agassiz Science Club is keeping a record of the location and dimensions of these boulders, on a map prepared for that purpose. One of the most interesting studies in this section is the glacial drift, which constitutes most of the surface of Atchison county. I have found it varying from a few feet in thickness to over 100 feet. During the past two years arrangements have been made with well borers to collect, in boxes prepared for the purpose, specimens of clay passed through, together with the thickness of the clay beds. This work has not progressed far enough to reach any definite conclusions. The clay lies in sharply separated beds, some of which are very thick. In 1868, Prof. Louis Agassiz, accompanied by Roscoe Conkling and others, visited northeast Kansas. Agassiz recognized in the red, gray, and green boulders on our hills a verification of the glacial theory he had worked out in his native Switzerland, viz., that these boulders were brought here by the ice sheet which about 10,000 years ago covered all the northern part of the northern continents. The ice sheet grated over the surface of the country, scraping up huge boulders and smaller particles from the limestones, granites, and greenstones of Canada and from the red quartzites of Minnesota and Dakota. These boulders were dropped by the melting ice on the prairies.

I have carefully observed this glacial deposit covering northeast Kansas from Kansas City to Junction City and Washington county. I have seen it at West Point and other places up and down the Hudson river; in Central Park, New York city; in the Sierra Nevada mountains, and along the Pacific coast. In fact, the ice sheet sprinkled its boulders and mud on top of the older deposits over all the northern continents as far south as the 39th parallel of latitude.

NOTES ON KANSAS PHYSIOGRAPHY.

By J. W. BEEDE. Read before the Academy January 2, 1897.

GENERAL OUTLINE.

Kansas erosion is from plain to plain rather than from ridge to plain. In other words, the elements have an elevated plain to break up and reduce to a plain of lower elevation, instead of a high ridge to reduce to a base level, as is the case in mountainous regions. At present, the parts under consideration are intermediate forms, varying according to the nature of the rocks of which they are composed and the climatic conditions to which they have been subjected.

In various parts of the state good examples of these intermediate forms of reduction may be seen, modified by climate and structure. The youngest is in the Red Beds, in the more highly developed part, and illustrates an early stage of reduction. The original plain is represented roughly by the more elevated summits, while the valleys and cañons represent the amount of material removed. A more advanced stage of erosion is represented in the eastern extremity of the Dakota formation. Here a slightly different climatic condition has obtained, and there is also a difference of rock structure. It has been subjected to other conditions which are as yet but very little understood. Near the Smoky Hill valley, the Permian shales on which the Dakota rests sink to a lower level than to the eastward or westward, which seems to be due to erosion, producing a marked unconformity. It may indicate a pre-Dakotan drainage channel. Section 3 is in the Carboniferous of eastern Kansas. This is the oldest of the